

MONTHLY WEATHER REVIEW,

NOVEMBER, 1879.

(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to November 14th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 158 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means 147 and 144 respectively, from the former; reports from 29 Sunset stations; 230 monthly registers from Voluntary Observers; 40 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from Voluntary Observers in, and the local Weather Service of, Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The general distribution of atmospheric pressure, as reduced to sea-level, is shown by the isobaric lines on Chart No. II. The area of highest pressure was over the South Atlantic States; the pressure was also apparently high off the Central Pacific Coast region.

Departures from Normal Values for the Month.—By comparison with the average of the past seven years, it is found that the barometric pressure during the present November has been above the average in California, New Mexico, the Southwest, Illinois, Michigan and thence eastward to the Atlantic States where the excess has been greatest; it amounts to 0.09 inch at Eastport, Boston and New York, 0.10 at Cape May, Washington, Charleston and Savannah, (and also at Knoxville, Tenn.,) 0.11 at Lynchburgh and Jacksonville and 0.12 at Norfolk, Wilmington and Augusta. A small deficiency occurs over the Northwest which apparently extends to the coast of Oregon; it amounts to 0.07 inch at Omaha, 0.06 at Pembina, 0.03 at Denver and Virginia City, 0.02 at Salt Lake City and 0.05 at Portland, Or.

General Barometric Range.—The general range for the whole country was about 2.00 inches, as may be seen from the following table, which gives the greatest departures of the actual barometric readings, as compared with the normal values for the month and the hour of observation. These departures refer only to the tri-daily telegraphic reports. An examination of the table shows that the greatest departures were + 0.70 at 11:00 p. m. of the 19th, at Bismarck, within the high area No. VIII, and — 1.31 at 3:00 p. m. of the 20th, at Halifax, in low area No. XII.

HIGH AREAS.				LOW AREAS.			
NO.	LOCATION.	DATE.	Departures from normal.	NO.	LOCATION.	DATE.	Departures from normal.
I	Illinois	Nov. 1, 7:00 a. m.	+ 0.44 inch.	I	Kingston	Nov. 3, 7:00 a. m.	— 0.34 inch.
II	Minnesota	Nov. 3, 7:00 a. m.	+ 0.46 inch.	II	Olympia, Or.	Nov. 4, 11:00 p. m.	— 0.34 inch.
III	Washington, D. C.	Nov. 5, 7:00 a. m.	+ 0.48 inch.	III	Pembina	Nov. 7, 7:00 a. m.	— 0.68 inch.
IV	Portland, Oreg.	Nov. 6, 11:00 p. m.	+ 0.30 inch.	IV	Dubuque	Nov. 8, 3:00 p. m.	— 0.54 inch.
V	Lower Lake region	Nov. 10, 3:00 p. m.	+ 0.34 inch.	V	Milwaukee & Escanaba	Nov. 8, 11:00 p. m.	— 0.54 inch.
VI	Halifax, N. S.	Nov. 14, 7:00 a. m.	+ 0.47 inch.	VI	San Francisco	Nov. 9, 3:00 p. m.	— 0.78 inch.
VII	Lynchburg, Va.	Nov. 17, 7:00 a. m.	+ 0.27 inch.	VII	Omaha	Nov. 12, 7:00 a. m.	— 0.55 inch.
VIII	Salt Lake City	Nov. 17, 11:00 p. m.	+ 0.57 inch.	VIII	Olympia	Nov. 11, 7:00 a. m.	— 0.43 inch.
IX	Bismarck	Nov. 19, 11:00 p. m.	+ 0.70 inch.	IX	Parry Sound	Nov. 14, 8:00 p. m.	— 0.64 inch.
X	Pittsburg	Nov. 24, 7:00 a. m.	+ 0.36 inch.	X	Chatham	Nov. 15, 11:00 p. m.	— 0.70 inch.
XI	North Carolina coast	Nov. 24, 11:00 p. m.	+ 0.36 inch.	XI	Olympia	Nov. 13, 3:00 p. m.	— 0.63 inch.
	Halifax	Nov. 27, 7:00 a. m.	+ 0.60 inch.	XII	Northern Texas	Nov. 18, 11:00 p. m.	— 0.27 inch.
	Ohio	Nov. 30, 7:00 a. m.	+ 0.50 inch.	XIII	Sydney	Nov. 19, 7:00 a. m.	— 0.22 inch.
	North Carolina coast	Nov. 30, 11:00 p. m.	+ 0.50 inch.	XIV	Parry Sound	Nov. 19, 3:00 p. m.	— 0.53 inch.
				XV	Halifax	Nov. 20, 3:00 p. m.	— 1.31 inch.
				XVI	Marquette	Nov. 22, 3:00 p. m.	— 0.56 inch.
				XVII	Pembina	Nov. 24, 7:00 a. m.	— 0.63 inch.
				XVIII	Davenport	Nov. 27, 7:00 a. m.	— 0.34 inch.
					Salt Lake City	Nov. 26, 7:00 a. m.	— 0.42 inch.
					Olympia	Nov. 29, 3:00 p. m.	— 0.36 inch.
					Pembina	Nov. 30, 3:00 p. m.	— 0.92 inch.

Local Barometric Ranges for the Month.—The monthly barometric ranges of actual pressure have been greatest in the extreme Eastern States, viz: Portland, 1.40 inch and Eastport, 1.61. The ranges have also been large for the Eastern Rocky Mountain Slope—apparently increasing as we go northward—and at Pembina the range was 1.37. Monthly ranges for San Francisco 1.10 inch, for Sacramento 1.02 and for Visalia 1.02 inch are also very large for that region.

Areas of High Barometer:—Eleven areas of high barometer have been recorded, none of which have been distinguished by particularly high pressures or very low temperatures. Areas Nos. VII, VIII and XI were accompanied by severe "northers" on the Texas coast, for which Off-shore Signals were ordered on the 17th and 28th at Indianola and Galveston.

No. I.—This is a continuation of No. VII of the preceding month, which was central on the 1st in Illinois, extending over the Ohio valley and Missouri, whence it moved rapidly eastward and disappeared on the 2nd off the Middle Atlantic coast.

No. II.—was central on the 1st northwest of Manitoba, moved slowly southeastward over the Upper Mississippi and Ohio valleys, was central over the latter on the 4th, and was over the Middle Atlantic States on the 5th. It was then apparently reinforced by an extensive area of cold air flowing south from the Gulf of St. Lawrence, and high pressure continued off the Atlantic coast until the 12th.

No. III.—This is a small area of high pressure that was off the coast of Oregon on the 5th, and continued during the 6th and part of the 7th.

No. IV.—Pressure rose on the 9th over the Missouri valley and an area of high barometer moved eastward over the Lake region and Middle States, where it was central on the 11th, after which it rapidly disappeared.

No. V.—On the 13th the barometer began to rise rapidly in the St. Lawrence Valley, while the lowest pressure was off the New England coast. The highest pressure moved southward over Nova Scotia and disappeared on the 14th.

No. VI.—The low barometer which was over the Upper Lake region on the 15th was immediately followed by a slight rise in the Northwest, and on the morning of the 16th the pressure was highest over Kentucky and Tennessee, whence it moved rather rapidly to Virginia, and on the 17th disappeared off the Middle Atlantic coast.

No. VII.—On the 15th the barometer rose over California, and an area of high pressure seems to have prevailed northwest of California, while the barometer was low over British America and Oregon. On the 16th the highest pressure moved southeastward, and on the morning of the 17th the barometer was very high over the northern Rocky Mountain plateau region. Salt Lake City reported a temperature of 15°, the lowest for the month. By the morning of the 18th high pressure had extended over the whole of the Upper Lake region, Texas and the eastern Rocky Mountain slope, being apparently highest in Wyoming Territory. The lowest temperature of the month occurred on the 18th at Stockton, 25° and Escanaba, 17°. The barometer continued high over the Northwest and Southwest and Rocky Mountain regions, and on the morning of the 19th, the highest pressure may be located in central Texas. The lowest temperatures of the month were reported, on the 19th, as follows: 29° at Castroville; 32° at San Antonio; 25° at Fort Sill; 27° at Brackettville; 28° at Eagle Pass; 32° at Rio Grande; 23° at Boerne; 21° at Fort Davis, and 19° at Uvalde.

No. VIII.—The great extension of the preceding area, No. VII, was probably connected with the development of the low area, which was central over Lake Superior on the morning of the 19th, and which was immediately followed by a still more decided high pressure, moving rapidly southward from Manitoba into the Missouri valley, where it was central on the morning of the 20th; lowest temperatures of the month are reported on the 20th, as follows: -9° at Pembina; -4° at Breckinridge; 0° at Duluth; 1° at Bismarck; 1° at Yankton; 8° at Omaha; 8° at La Crosse; 10° at St. Paul; 14° at Dubuque; 14° at Grand Haven; 15° at Davenport; 16° at Leavenworth; 17° at Keokuk; 21° at St. Louis. On the 21st, in the morning, the pressure was highest over the Ohio valley and Gulf States, and lowest temperatures of the month occurred in the morning, very generally in the East Gulf States, from 29° to 38°; in the South Atlantic States, from 20° to 33°; in Tennessee and the Ohio valley, from 21° to 27°; in the Lower Lake region, from 9° to 19°. At this time, high northwest winds prevailed over the Middle States and New England, attending the very low pressure over the Gulf of St. Lawrence; consequently, in these regions, the lowest temperatures of the month also occurred on the 21st, although the pressure was low and the weather snowing or clearing. The minima were for New England, from 7° to 17°, except Mount Washington, -20°; for the Middle Atlantic States, from 15° to 22°. This area of high pressure, No. VIII, after reaching the Middle Atlantic coast on the 22nd, seems to have pushed northeastward and disappeared on the 23rd. The lowest temperatures of the 22nd were about the same as those of the 21st.

No. IX.—The high barometer No. VII continued with slowly diminishing pressure over the Rocky Mountain region while a second low pressure moved southeastward to the Lake region and was followed by high barometer No. IX whose origin is therefore similar to that of No. VIII. It was central in Dakota on the 22nd, in the morning, moved rapidly southeastward over the Lower Missouri and Ohio valleys, was central in Virginia on the 24th, in the morning, and over the South Atlantic States on the 25th, in the morning, after which it disappeared. The lowest temperatures accompanying this area were not so low as those accompanying No. VIII.

No. X.—The low pressure over the northern portion of the Lake region on the 24th, was followed by an area of moderately high pressure, central in the Missouri valley on the morning of the 25th. The barometer generally rose during that day, with southerly winds over the Ohio valley and East Gulf States. On the morning of the 26th, highest pressure was central over Pennsylvania, and on the morning of the 27th, over Maine and the Lower St. Lawrence valley, and on the morning of the 28th, was east of Nova Scotia.

No. XI.—A severe storm which passed northeastward over the Lake region on the 28th, was followed by a rising barometer from Texas northward to Manitoba, but as a storm was at that time also central near Vancouver's Island, the barometric rise in Manitoba was checked, and the area of highest pressure remained in Texas, whence it extended northeastward and was by the morning of the 29th, central from Missouri to Minnesota; on the morning of the 30th it was central in the Ohio valley and disappeared on the 1st of December off the Middle Atlantic coast.

Areas of Low Barometer.—Eighteen areas of low pressure have passed over or near the region covered by the charts, of which, one, No. XII., (came from the West India Islands,) six, Nos. III, IV, V, X, XV and XVI) originated in the Rocky Mountains, or to the westward thereof, passed southeastward to southern Colorado, and thence east and northeastward to the Gulf of St. Lawrence. Four, namely, Nos. XI, XIII, XIV and XVIII, passed southeastward over Manitoba, thence to the Lower Lake region, and thence northeastward. Three, namely, Nos. II, VI and IX, passed from British Columbia eastward to the Gulf of St. Lawrence.

No. I. This area began in Iowa, 3 p. m. of the 1st, and was accompanied by extensive snow and high winds over the Lake region and New England, disappearing on the 4th, off the coast of Nova Scotia. This storm produced the first snow of the season over the southern portion of the State of New York and along the New England coast; in the interior the snowfall was quite heavy, a fall of twelve inches being reported at several places in Ontario, New York, Vermont and New Hampshire; at Brattleboro', Vt., twenty inches were reported. Cautionary Signals were ordered on the 2nd, at 4 p. m., from Milwaukee to Oswego, and were generally justified. Off-shore Signals were ordered from New York to Lewes, 2nd, 11 p. m., and from Cape Henry to Macon on the 3rd at 7 a. m., and were generally justified. Cautionary Signals were ordered, 3rd, 7 a. m., from New Haven to Eastport, and were partly justified. Several disasters to shipping occurred on the Lakes; schooner "Leesburg" went ashore on Cape Elizabeth, Me., and broke up; her crew of 5 men are supposed to have been lost.

No. II.—The pressure fell on the 4th in Washington Territory, and an extensive area of low pressure moved from Vancouver's Island nearly due eastward, and disappeared north of the Lake region on the 7th. Rain occasionally fell at our northern stations, and the disappearance of the low area was attended by the formation of a trough apparently extending from James's Bay to Texas, into which low area No. III was rapidly merged. No high winds accompanied area No. II, unless previous to its arrival on the Pacific coast. Cautionary Signals were ordered on the 4th, at 7 a. m., from Duluth to Chicago, and were not justified by high winds accompanying this area, but were partially justified by the high winds accompanying low area No. III.

No. III was, on the morning of the 7th, central in Utah, and on the 8th moved from Kansas northeastward to the Upper Lakes, where rain and occasional high winds prevailed. On the 9th, as it passed to the northward, high southwest winds continued on the Lower Lakes. It disappeared on the 10th near Newfoundland. On the 8th, in the afternoon, as it passed over the Upper Mississippi valley a tornado occurred near Lee's Summit, Mo., and a terrific hail-storm in Crawford Co., Ark., which places were at that time apparently at the southwest extremity of a very elongated area of low pressure. Cautionary Signals were ordered up on Lake Michigan on the 8th at 4 p. m., and were partially justified; also from Mackinaw to Buffalo on the 8th at 11 p. m., and were justified. Cautionary Signals were ordered at Rochester and Oswego on the 9th at 7 a. m., and were not justified; also from Sandy Hook to Lewes on the 9th at 7 a. m., which were partly justified.

No. IV.—This area of low pressure appears to have moved southward along the California coast or was possibly a trough of low pressure trending northeastward and approaching the coast from nearly due west. It passed eastward over California on the 9th, with high winds off the coast and heavy rains over the southern portion of the state; at San Francisco the barometer fell to 29.26, with a high SE. wind, which is the lowest reading recorded at this station during the past nine years. Snow and rain were general throughout Arizona; snow covered all the mountain tops and in the ridges south of Prescott drifted to a depth of 1½ and 2½ feet. Thence over Colorado on the 10th, northeast to Lake Superior on the 11th and eastward to Maine on the 12th, where it disappeared. Brisk and high winds prevailed over the Lakes on the 11th in its advance.

No. V began in Utah on the 11th and followed area No. IV by about twenty four hours, keeping somewhat to the southward. A few stations reported high northerly winds on Lake Michigan on the 11th in its advance, and severe winds prevailed on the 12th over the Lake region. At 5 p. m. of the 12th (local time), a tornado passed over Detroit, Mich., which city was at that time evidently at the centre of lowest pressure as shown by the tri-daily telegraphic isobars. At night severe wind and rain storms, accompanied by thunder and lightning, prevailed over the southern part of New York State. Cautionary Signals were ordered for Lake Michigan on the 11th at 11 p. m., and were partially justified on the 12th; and were ordered from Port Huron to Sandusky on the 12th, at 7 a. m., and were generally justified. They were

ordered from Cleveland to Oswego on the 12th at 4 p. m., and were not justified. Off-shore Signals were ordered on the 12th, at 11 p. m., from Sandy Hook to Cape Hatteras, and were only partially justified.

No. VI.—Pressure fell in British Columbia and Washington Territory on the 10th, and was apparently lowest at Vancouver's Island at 11 p. m. This area moved westward along our northern border, and disappeared north of the Lake region on the 13th. Its track was too far north to be charted on our Map No. I. No high winds are reported in connection with it but abundant rains in the North Pacific region.

No. VII appears to have originated in Iowa, between extensive areas of northwest and easterly winds. It passed rapidly northeastward, and between the hours of 10 a. m. and 2 p. m., high southwesterly gales, with heavy rains, thunder and lightning prevailed from southern Illinois to Ohio, and considerable damage was done to buildings, &c., in over 25 cities in these states, Indiana and Kentucky. On the afternoon of 14th, high southerly winds with rain prevailed over the Lower Lake region. It disappeared on the 15th, north of the St. Lawrence river. Cautionary Signals were ordered on the 14th at 7 a. m., from Mackinaw to Oswego, about half of which were justified; also at 7 a. m. from New York to Lewes, which were justified; also from New Haven to Eastport, on the 14th, at 4 p. m., which were partly justified.

No. VIII began on the 15th at 7 a. m. over the Lower Lake region as a branch of the preceding, and kept a little south of the track of that one, passing over the Gulf of St. Lawrence and reaching Newfoundland on the morning of the 16th. High southwest winds were occasionally reported on the 15th from the stations on the Middle and East Atlantic coasts, and brisk northwest winds prevailed on the 16th on the Lower Lakes. Cautionary Signals were ordered on the 15th at noon from Baltimore to Cape Hatteras, and were generally justified by high southwest winds.

No. IX.—The pressure fell on the 13th in the North Pacific region with southerly winds and rain; the lowest pressure evidently passed over British Columbia and continued within the northern limit of our stations until it disappeared on the 15th, in the afternoon, north of the Upper Lake region, where the barometer had fallen quite low. A heavy wind and snow-storm was reported as occurring on the 14th between Denver and Leadville, Col., during which several men were frozen to death, and high southwest winds were reported from Lake Michigan on the afternoon of the 15th.

No. X.—Was located on the 15th in Wyoming, and snow with occasional high winds prevailed during the night in Wyoming, Colorado and Utah. The central depression extended rapidly southeastward into northern Texas, where it was central on the 16th at 11 p. m., whence it moved eastward, followed by increasing rain or snow, which by midnight of the 17th prevailed on the Lower Lakes and over the Ohio and Mississippi valleys, while the severe "norther" had swept down to Texas and the Gulf coast. On the 18th the lowest pressure passed northeastward from Virginia to Nova Scotia preceded by northeast winds and snow or rain, while the West India hurricane No. XII was advancing northward toward the Bahamas, and northwest gales were prevailing in the eastern portion of the Gulf of Mexico. Cautionary Signals were ordered up on the 17th, while the storm centre was passing from Missouri to Virginia, as follows: at 7 a. m. from Milwaukee to Erie, which were justified on Lake Erie; at 4 p. m. from Buffalo to Oswego, which were not justified; also at 4 p. m. from Wood's Holl to Wilmington which were subsequently justified by Off-Shore winds; at 11 p. m. from Eastport to Boston which were justified. Off-shore Signals were ordered at 7 a. m. of the 17th for Indianola and Galveston which were justified by northerly gales. Off-shore Signals were ordered from New York to Baltimore, the 18th at 4 p. m. which were generally justified. During the night of the 17th a severe NE. snow-storm prevailed over Lake Ontario during which a steam-tug and several scows were sunk and nine persons drowned off Sackett's Harbor, N. Y.; on the 18th, Schooner Sasso left Erie during the display of signals, was driven ashore near Fairport and became a total wreck.

No. XI.—The pressure fell very rapidly on the morning of the 18th in Manitoba, preceding low-area No. XI, which seems to have moved southeastward toward the Upper Lake region, over which it passed on the 19th, accompanied by snow and severe gales from the southwest and northwest. On Lake Michigan a heavy sea from the southwest prevailed, driving six vessels ashore along the east coast. It was central in the Upper St. Lawrence valley on the morning of the 20th, at which time cold northwest gales prevailed over the Lake region, West Gulf and Middle Atlantic coasts, and high northwest winds at intermediate points. At this time, the West India hurricane, No. XII, was central east of Long Island, and by 3 p. m. of the 20th, both of these severe storms had merged into one, which was then central near Halifax, where the pressure was 28.59. Cautionary Signals were ordered on the 19th, at 7 a. m., from Duluth to Oswego, which were all justified, but were late for Lakes Michigan and Huron. They were ordered on the 19th, at 4 p. m., from Eastport to Cape Henry, which were justified by winds attending the hurricane No. XII. The following remarks from lake stations indicate the severity of this storm: Milwaukee, 19-20, storm considered one of the severest on the Lakes for years; schooners "North Star" and "Elida" ran ashore near Little Sturgeon Bay; on the east shore of the lake the disasters were serious and many. Port Huron, 19th and 20th, storm very severe on the lake; a number of shipwrecks and several lives lost reported from Sand Beach Harbor; several vessels sailed during display, but meeting with a rough sea, were obliged to put back. Toledo, 19th and 20th, storm very severe on lake; much damage to fishing nets, &c.; numerous disasters reported on lakes. Erie, 20th, schooner 'Waucousta' driven ashore in attempting to enter harbor. Cleveland, 20th, storm very severe; schooner 'Sumatra' was driven ashore near Union depot. Oswego, 19th to 20th, schooner 'Dominion' sailed on the 19th, encountered the storm and, in attempting to put back, lost her bearings and went ashore; vessel a total loss.

No. XII.—This hurricane, from the West Indies, first appears on the Signal Service tri-daily maps, in the falling barometer and increasing winds at Havana, Key West and Punta Rassa, at midnight of the 18th, at which time the centre was evidently some distance to the eastward; then it moved very rapidly north and northeastward, passing Cape Hatteras at 11 p. m. of the 19th and Halifax at 3 p. m. of the 20th. It was preceded by heavy rain on the South Atlantic coast, and snow in the Canadian Provinces and followed by snow in New England. The lowest pressures recorded were at Cape Hatteras, 29.47, at 11 p. m. of the 19th, and Halifax, 28.59, at 3 p. m. of the 20th. Cautionary Signals were ordered in advance of this hurricane, as follows:—On the 20th, at 7 a. m., from Cape Lookout to Smithville, which were, however, already late. Off-shore Signals were ordered on the 20th, at 7 a. m., from New York to Baltimore, which were justified. Among the reports from vessels are the following:—The schooner O. S. Bailey, from Dominica November 8th, on the 17th, encountered furious gale; 20th, tremendous seas boarded vessel; crew were taken off and landed at Baltimore on November 27th; exact location not given. Steamer Hermod, 39°N. 66°W., hurricane for 5 hours from SE. to NW. Steamer Llanarthan, 50° 50' N. and 32° 10' W., from the 18th to the 21st, SE. to NE. gales and high sea. Steamship Leipsig, 19th, 40° N. and 69° W., barometer 29.05; wind NNE. to NW. force 10, heavy NW. sea. Brig Una, 19th, 33°N. 73°W., heavy NW. gale, barometer 29.25. Schooner Victor Ping, 19th, in the Gulf Stream, NW. gale. Schooner Kit Carson, 19th, in Gulf Stream, NNE. gale; decks swept by high sea. Ship Stewart Freeman, 200 miles east of Henlopen, 19th, NW. gale. Barque Lincoln, 39°N. 68°W., 19th, ESE. to WSW. heavy gale. Steamer Albert, between Magdalen Islands and Pleasant Bay, November 20th. 3:30 p. m., wind suddenly rose to violent gale; 8:30 p. m., veered to NE., hurricane; barometer 27.60 (?). Barque Susan A. Blaisdall, 20th, 31°N. 72°W., severe WNW. gale for forty-eight hours. Barque Grasmere, 29th, [19th (?) or 20 (?)] 39°N. 66°W., terrific east hurricane for two hours; then south hurricane four hours; then calm half an hour, then hurricane more severe than at first. Schooner "Addie Fuller" on the 19th, in 36° 03' N. 74° 33' W., and 20th in 34° 20' N. 74° 39' W., reports during the night between the 19th and 20th had a severe hurricane, lowest barometer 29.30 about midnight as read off; highest force of wind 80 to 90; wind commenced from NNE. and backed gradually to NW. Baltimore, November 20th, Bay steamers delayed and reported heavy NW. gales and cold weather; harbor very rough and tide unusually low; steamer "Mystic" driven ashore and bilged near Queenstown. Several smaller vessels capsized and sunk in Bay and some lives lost.

No. XIII.—apparently moved southeastward into Manitoba where the barometer fell very rapidly on the evening of the 21st. The area of lowest pressure moved east-southeastward from over Lake Superior into the Upper St. Lawrence valley, where it was central 3 p. m. of the 23rd, having been accompanied over the Lake region by snows and high southerly, veering to northwest winds which had generally subsided by 11 p. m. of the 23rd. The storm-centre reached Newfoundland by 3 p. m. of the 24th. Cautionary Signals were ordered on the 21st at 11 p. m. from Duluth to Milwaukee which were partly justified; also on the 22nd at 7 a. m. from Chicago to Oswego which were generally justified, and on the 22nd at 11 p. m. from Eastport to Cape Henry which were justified, but rather late for the Middle Atlantic coast. Off shore Signals were ordered on the 23rd at 7 a. m. from Cape Lookout to Cape Henry which were justified, and, also, at 11 p. m. from Lewes to Portland, Me., which were mostly justified.

No. XIV.—This area pursued a path nearly parallel to that of the preceding, but lying slightly to the northward. It was central in Manitoba 7:00 a. m. of the 24th, and in the Lower St. Lawrence at 3 p. m. of the 25th, having been accompanied over the Lake region by high SW. to NW. winds and occasional light snows. It disappeared on the 26th, in the morning, over the Gulf of St. Lawrence. Cautionary Signals were ordered on the 24th at 7 a. m. from Duluth to Port Huron which were partly justified; at 4 p. m. from Detroit to Oswego which were generally justified, and at 11 p. m. from Sandy Hook to Cape May, only partly justified. Nov. 25th, Buffalo, nearly all vessels that left port were forced to put back and reported a terrific storm on the lake.

No. XV.—An extensive area of low pressure prevailed over the Rocky Mountain region on the 25th, in the morning, and the low centre No. XVI was at that time well marked in the Northern Rocky Mountain Plateau region, and on the next day the low centre No. XV developed on the Eastern Rocky Mountain Slope. No. XV passed slowly northeastward over Iowa, where it was central at 3 p. m. and 11 p. m. of the 26th, while the area of southerly winds, rain or snow extended over the entire Lake region and still further to the northeastward. High winds prevailed on the Lakes on the afternoon of the 27th, and by 11 p. m. a trough of low pressure extended from the centre of No. XV, which was then near Grand Lake, Canada, to the centre of No. XVI, which was then in the Missouri valley. Cautionary Signals were ordered on the 26th at noon from Duluth to Chicago, and at 3 p. m. from Grand Haven to Buffalo, and at 11 p. m. from Rochester to Oswego, all which were generally justified. On the 27th, at 11 p. m., while the storm was central in the valley of the Ottawa river, Cautionary Signals were ordered at Eastport.

No. XVI.—This area appears to have moved southward into Idaho on the morning of the 25th, areas of cloud and rain having preceded it according to the reports from stations in the British possessions. It moved slowly southeastward into the northern portion of New Mexico, where it was central on the morning of the 27th, and thence eastward through Indian Territory, where it turned northeast, and at 3 p. m. of the 27th a trough of low pressure extended from Indian Territory northeastward to Lake Huron, where No. XV was then central. The subsequent path of No. XVI lay a little to the south of the path of No. XV, and on the morning of the 28th, when No. XVI was central in Michigan, No. XV had apparently

disappeared, and a severe storm of wind, with rain and snow, prevailed over the Lake region throughout the day. High southerly winds were also reported from the Middle and East Atlantic coasts. The storm passed over the mouth of the St. Lawrence on the 29th and disappeared over the Gulf on the 30th. Cautionary Signals were ordered on the 28th at noon from New York to Lewes, and at 4 p. m. from Lewes to Smithville, and from New York to Portland, which were generally justified as Cautionaries, and were subsequently changed to Off-shore and again justified. In the rear of this storm northerly winds prevailed over the southwest, and Cautionary Off-shore Signals were ordered on the 28th at 7 a. m., at Indianola and Galveston, and were justified. November 28th, Cleveland, "The most severe storm of the season; fences and trees blown down; lake very rough."

XVII.—This was an indefinite area of low pressure which appeared off the coast of British Columbia on the 29th and 30, where it was accompanied by southerly winds and rain. It appears to have passed eastward into British America. Its track is too indefinite to be charted on Map No. I.

No. XVIII.—This depression appears to have been central north of Dakota on the morning of the 30th, and was probably a branch of No. XVII. By midnight it was north of Lake Superior, while high southerly winds and occasional light snows were reported at several stations in the Lower Lake region. Its path is too indefinite to be traced on Map No. I.

INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present *Review*. No. IV indicates the probable course of low-pressure areas over the North Atlantic ocean and neighboring waters and continents during the month of October, 1879, and is based upon data received at this office up to November 30th, 1879. Nos. V and VI are charts for the month of April, 1878 and are based upon International Simultaneous Observations, as described in the *Review* for July, 1879, supplemented by such other observations as have been considered specially applicable and trustworthy.

Since the publication of the October *Review* valuable reports of observations relating to low-area No. V made at Cienfuegos, Baracoa and Sagua le Grand, Cuba, have been received through Mr. Vines, of Havana, but which do not change the track of centre as already given on Chart No. I for that month.

On Chart No. IV, the tracks of fifteen areas of low-pressure are traced, which, during a portion of their existence, were located over the North Atlantic and North Pacific oceans or neighboring waters. Portions of areas Nos. I, V, VI, XIII and XIV appeared on Chart No. I of October *Review*. No. II was over the eastern portion of the Gulf of Mexico during October 5th and 6th. There are decided indications of its existence during the 3rd and 4th, in the positions, as shown; on the 7th, it merged with an extensive depression over the Northwest. No. IV originated about mid ocean and, on the 11th, 12th and 13th, moved northward off the banks of Newfoundland as a very severe storm. It is probable that the depression which appeared to the northwest of the British Isles on the 16th, was a continuation of this area. Nos. V and VI appeared on Chart I of the October *Review* and are here reproduced, as it is probable that the area formed by their union, moved over the northern portion of the Atlantic, from the 20th to the 25th. Nos. I, III and from VII to XV, can only, as yet, be traced over the area shown.

TEMPERATURE OF THE AIR.

The general distribution of temperature for *November*, 1879, is shown by the isothermal lines upon Chart No. II, accompanying which is a table of comparative temperatures. Like the preceding month the average temperature of the present month has been above the normal in the districts east of the Rocky Mountains and below the normal in those to the westward. The departure from the normal, however, over the eastern portions of the country has not been so marked as it was for October. The excess is greatest from the Gulf coast to the Ohio and Upper Mississippi valleys, over which region it amounts to four or five degrees; in the Atlantic States, Lake region and along the eastern slope of the Rocky Mountains it varies from a half to one and a half of a degree. West of the Rocky Mountains the departure from the normal has been greater than last month and has amounted to —2.5 degrees along the Pacific coast and from —3 to —5 degrees in Utah and Idaho.

Minimum and Maximum Temperatures:—An examination of the minimum temperatures shows that they occurred, with few exceptions, from the 17th to the 22nd, during the regime of high areas Nos. VII and VIII, and ranged, during these days, from —9° at Pembina, Dak., to 39° at Brownsville, Tex.; from 0° at Alpena, Mich., to 32° at Pensacola, Fla.; and from 11° at Eastport, Me., to 60° at Key West. On the summit of Pike's Peak, the minimum (—15°) occurred on the 17th and 18th, and on the summit of Mount Washington (—20°) on the 20th. The exceptions to the above generalization occurred on the 4th in the Lake region; from the 24th to the 28th over the Pacific States, Plateau Districts and Montana, and from the 28th to the 30th, over the Eastern Slope of the Rocky Mountains and Texas. An examination of the maximum temperatures shows that they occurred, almost without exception, during the first half of the month. In the Pacific States, Plateau Districts, Eastern Rocky Mountain Slope, and northern part of the Northwest, they occurred from the 3rd to the 6th, and varied, as follows:—65° at San Francisco, Cal., 80° at Red Bluff, Cal., 67° at Winnemucca, Nev. and Salt Lake City, Utah, 76° at Denver, Col. and North Platte, Neb., and 44° at Breckinridge, Minn. Over the eastern portion of the United States, they occurred chiefly from the 8th to the 15th, and varied from 54° at Escanaba, Mich. and 55° at Eastport, Me., to 92° at Laredo, Tex. and 84° at Key West, Punta Rassa, and Augusta. The maximum on the summit of Pike's Peak (33°) occurred on the 6th, and on the summit of Mount Washington, (44°) on the 9th, 10th and 15th.